

Operating Manual

RISH PQM Power Quality Monitor



Three Phase (3W/4W)

Three Phase Touch Screen Power Quality Monitor with TOD Installation & Operating Instructions

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1. Introduction

This instrument is a panel mounted 96 x 96mm DIN Quadratic Digital metering system for the measurement of important electrical parameters like AC voltage, AC Current, Frequency, Power, Energy(Active / Reactive / Apparent) . The instrument integrates accurate measurement of technology (All Voltage & Current measurements are True RMS upto 56th Harmonic) with 320x240 Pixels touch screen TFT LCD display.

This instrument can be configured and programmed at site for the following:

PT Primary, PT Secondary, CT Primary, CT Secondary (5A or1A), 3 phase 3W or 3phase 4W system , Time Of Day metering, Power Quality Parameter.

The front panel has a 3.5" Touch Screen through which the user can move across the available measurement readings, reset the energy,Min/Max (System Voltage and System Current) and configure the product settings.



Main Menu is divided into 8 submenus. Every submenu contains list of options. By touching the icons on the main menu , submenu can be accessed. System , Voltage , Current & Power submenu contains measurement of basic electrical parameters. Scope submenu contains waveforms & phasor diagram. Power Quality submenus can be used to access harmonic, sag , swell & over current data. Energy & TOD option gives total energies and all TOD energies & costs. Setup option can be used for complete meter settings.

TABLE 1:

Measured Parameters	Units of Measurement
System Voltage	Volts
System Current	Amps
Voltage VL1-N(4wire only)	Volts
Voltage VL2-N(4wire only)	Volts
Voltage VL3-N(4wire only)	Volts
Voltage VL1-L2	Volts
Voltage VL2-L3	Volts
Voltage VL3-L1	Volts
Current L1	Amps
Current L2	Amps
Current L3	Amps
Neutral Current (4 wire only)	Amps
Frequency	Hz
Active Power (System / Phase (4 wire only))	KW
Reactive Power (System / Phase (4 wire only))	KVAr
Apparent Power (System / Phase (4 wire only))	KVA
Power Factor (System / Phase (4 wire only))	—
Phase Angle (Phase(4 wire only))	Degree
Active Import Energy (up to 14 Digit resolution)	kWh
Active Export Energy (up to 14 Digit resolution)	kWh
Reactive Import Energy (up to 14 Digit resolution)	kVArh
Reactive Export Energy (up to 14 Digit resolution)	kVArh
Apparent Energy (up to 14 Digit resolution)	kVAh

TABLE 1(continued):

Measured Parameters	Units of Measurement
Current Demand	Amps
KVA Demand	KVA
KW Import Demand	KW
KW Export Demand	KW
Max Current Demand	Amps
Max kVA Demand	KVA
Max KW Import Demand	KW
Max KW Export Demand	KW
Run Hour	Hours
On Hour	Hours
Number of Interruptions	Counts
Phase Reversal Indication (4 wire only)	—
V1 THD*	%
V2 THD*	%
V3 THD*	%
I1 THD	%
I2 THD	%
I3 THD	%
System Voltage THD	%
System Current THD	%
True representation of Phasor Diagram (4 wire only)	—
True representation of Voltage Waveform	—
True representation of Current Waveform	—

***Note : THD Parameters are L-N in case of 3P 4W & L-L in case of 3P 3W .**

TABLE 1(continued):

Measured Parameters	Units of Measurement
Fundamental Voltage V1, V2, V3	Volts
THD V1, V2, V3	%
Fundamental Current I1, I2, I3 *	Amps
THD I1, I2, I3 *	%
Fundamental Active Power L1, L2, L3 (4wire only)	KW
Fundamental Reactive Power L1, L2, L3 (4wire only)	KVAr
Fundamental Apparent Power L1, L2, L3 (4wire only)	KVA
Fundamental Power Factor L1, L2, L3 (4wire only)	—
RMS Voltage of Harmonic N of phase L1, L2, L3	Volts
Voltage Harmonic Distortion of Harmonic N of L1, L2, L3	%
RMS current of Harmonic N of L1, L2, L3 *	Amps
Current Harmonic Distortion of Harmonic N of L1, L2, L3 *	%
Harmonic N Active Power L1, L2, L3 (4wire only)	KW
Harmonic N Reactive Power L1, L2, L3 (4wire only)	KVAr
Harmonic N Apparent Power L1, L2, L3 (4wire only)	KVA
Harmonic N Power Factor L1, L2, L3 (4wire only)	—
Active energy import per zone of current date	Kwh
Active energy import cost per zone of current date	—
Active energy export per zone of current date	Kwh
Active energy export cost per zone of current date	—
Reactive energy import per zone of current date	KVArh
Reactive energy import cost per zone of current date	—
Reactive energy export per zone of current date	KVArh

NOTE:

N is the harmonic no of selected harmonic.

* These parameters are not measured for L2 in 3 phase 3 wire network.

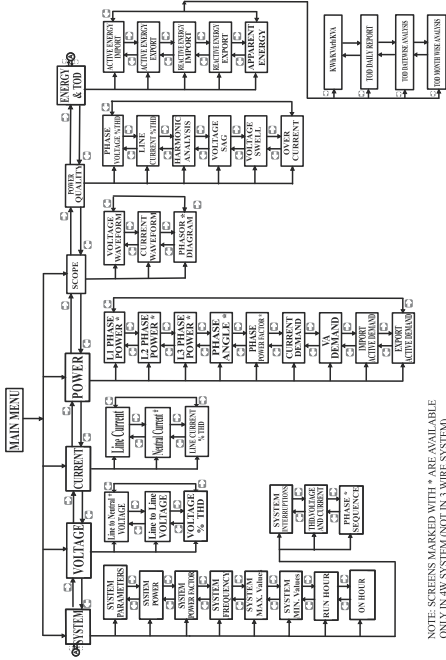
TABLE 1(continued):

Measured Parameters	Units of Measurement
Reactive energy export cost per zone of current date	—
Apparent energy per zone of current date	KVAh
Apparent energy cost per zone of current date	—
Active energy import per date up to last 31 days	Kwh
Active energy import cost per date up to last 31 days	—
Active energy export per date up to last 31 days	Kwh
Active energy export cost per date up to last 31 days	—
Reactive energy import per date up to last 31 days	KVArh
Reactive energy import cost per date up to last 31 days	—
Reactive energy export per date up to last 31 days	KVArh
Reactive energy export cost per date up to last 31 days	—
Apparent energy per date up to last 31 days	KVAh
Apparent energy cost per date up to last 31 days	—
Active energy import per month up to last 12 months	Kwh
Active energy import cost per month up to last 12 months	—
Active energy export per month up to last 12 months	Kwh
Active energy export cost per month up to last 12 months	—
Reactive energy import per month up to last 12 months	KVArh
Reactive energy import cost per month up to last 12 months	—
Reactive energy export per month up to last 12 months	KVArh
Reactive energy export cost per month up to last 12 months	—
Apparent energy per month up to last 12 months	KVAh
Apparent energy cost per month up to last 12 months	—

2. Measurement Reading Screens

In normal operation the user is presented with one of the measurement reading screens out of several screens. These screens from particular submenu may be scrolled through one at a time in incremental order by touching the " ➡ key" and in decremental order by touching " ⬅ key" on that screen.

MeasurementParameter Screens



NOTE: SCREENS MARKED WITH * ARE AVAILABLE ONLY IN 4W SYSTEM (NOT IN 3 WIRE SYSTEM)

Harmonic Analysis : When this option is selected from Power Quality menu, meter shows the graphical analysis of the harmonics selected in Setup -> Power Quality Setup -> Harmonic Setup L1/L2/L3. Harmonics are plotted considering fundamental as 100 %. When particular bar is touched, further details of that particular harmonic / fundamental are shown. User can view RMS values of voltage and current , voltage & current harmonic distortion % , kW / kVAR / k VA / PF (in 3p 4w only) of that selected harmonic by using side arrow keys.

Sag / Swell / Over Current : These screens show the nos of sag / swell / over current that instrument has detected with the timestamp of arrival of events. Instrument stores the log of up to 30 events on FIFO basis.

Energy and TOD :

Daily report: This screens shows the zone wise energy , its applicable tariff rate & cost of that zone in table format. The total energy accumulated for current day and related cost is also shown.

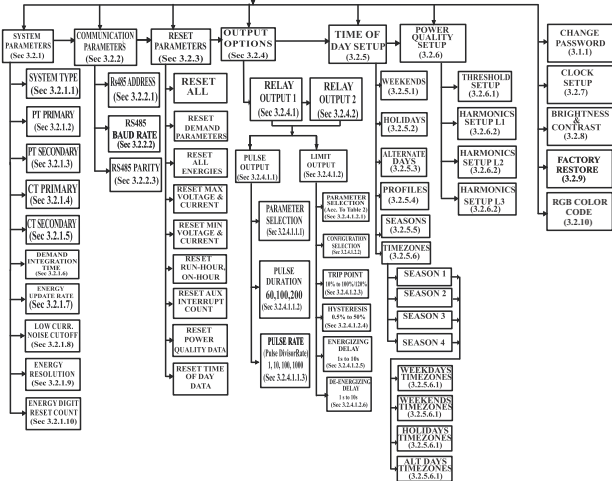
Date wise Analysis : This screen shows the graphical trend of per date energy. Up to last 30 days data is shown. By touching on the bar , energy and cost of that date can be seen.

Month wise Analysis : This screen shows the graphical trend of per month energy. Up to last 12 months data is shown. By touching on the bar in graph, energy and cost of that month can be seen.

Setup Parameter Screens

PASSWORD
(Sec 3.1)

ENTER



3. Programming

The following sections comprise step by step procedures for configuring the instrument for individual user requirements.

To access the set-up screens touch on the "⚙️ SETUP" icon in Main Menu. This will take the User into the Password Protection Entry Stage(Section 3.1).

3.1. Password Protection

Password protection can be enabled to prevent unauthorised access to set-up screens, by default password is "0000".

Password protection is enabled by selecting any four digit number.



After touching "⚙️ SETUP" icon Password protection screen is displayed. Screen consists of 0 to 9 digit input keypad for entering the password very similar to any calculator in touchscreen mobile. "Enter Password" is displayed on screen at start so that user can enter password using displayed keypad.

Touching "1" key" will display 1 in display area, similarly user can enter remaining 3 digits.

For deleting any digit while entering password, user can touch "DEL" key".

After entering the complete password user needs to confirm password by touching "ENTER" key".

Password confirmed.

If Entered password is correct then "Password Accepted" is displayed & user will enter into setup menu.

Password Incorrect.

If Entered password is wrong then "Password Rejected" is displayed & user need to re-enter the password.

After wrong password is entered, user needs to touch "ENTER" key" for trying another password.

3.1.1 Change Password



Change Password Option is the 7th option in list of "SETUP" submenu, so can be accessed by a simple touch anywhere in " Change Password" row.


In this screen user first needs to enter the current password.



After input of correct password, "PASSWORD ACCEPTED" is displayed & now user can enter the new 4 digit password.



New Password confirmed.

After entering new password user needs to touch "  " key" to confirm.

After confirming "PASSWORD CHANGED" is displayed on screen, which ensures successful changing of the password.

3.2 Menu selection.

After entering in the SUBMENU 8 - SETUP, user will be asked to enter password & after input of correct password list of following parameters will be displayed on screen :-

3.2.1 SYSTEM PARAMETERS

3.2.2 COMMUNICATION PARAMETERS

- 3.2.3 RESET PARAMETERS
- 3.2.4 OUTPUT OPTIONS
- 3.2.5 TIME OF DAY SETUP
- 3.2.6 POWER QUALITY SETUP

- 3.2.7 CLOCK SETUP
- 3.2.8 BRIGHTNESS & CONTRAST
- 3.2.9 FACTORY RESTORE

Touching on SYSTEM PARAMETER will open the system parameters list screen. Then these screens from particular parameter may be scrolled through one at a time in incremental order by touching the "➡ key" and in decremental order by touching the "⬅ key" on given touch screen.

3.2.1 System Parameters Selection

After entering in the "SYSTEM PARAMETERS", List of following parameters will be displayed :-

- 3.2.1.1 SYSTEM TYPE
- 3.2.1.2 PT PRIMARY(L-L)
- 3.2.1.3 PT SECONDARY(L-L)
- 3.2.1.4 CT PRIMARY
- 3.2.1.5 CT SECONDARY
- 3.2.1.6 DEMAND INTEGRATION TIME
- 3.2.1.7 ENERGY UPDATE RATE
- 3.2.1.8 LOW CURRENT NOISE CUTOFF
- 3.2.1.9 ENERGY RESOLUTION
- 3.2.1.10 ENERGY DIGIT RESET COUNT

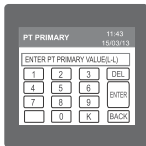
3.2.1.1 System Type



This screen is used to set the system type .Two types: 3 phase 3 wire & 3 phase 4 wire system are displayed on screen. Touching radio button in front of particular type will select that type. Touch on " key" will confirm the system type. Touching the " key" will keep the old selected setting and will return to previous menu.

Note : If system type is changed from 3 phase 4 wire to 3 phase 3 wire , relay parameter selection will be set to NONE.

3.2.1.2 Potential Transformer Primary Value

The nominal full scale voltage will be displayed as Line to Line Voltages for all system types.



This screen can be accessed only from system parameters list menu. Here again 0 to 9 digit input keypad is provided to set value of PT Primary, & user can confirm this value with a simple touch “ ENTER key”. “ K key” is used to multiply value by 1000.

In case presently displayed Potential Transformer Primary value together with the Current Transformer Primary value, previously set, would result in a maximum power of greater than 666.6 MVA per phase, “Invalid value” will be displayed. Then the valid range will be displayed.


Valid range of PT primary setting value is from **100 VL-L to 692.8 KVL-L**. If value outside the range is entered, It will display “INVALID VALUE” followed by correct range of parameter.

Note : Setting PT primary value will reset all TOD data & all energies.

While setting PT primary value if auxiliary supply gets off, reset TOD data after auxiliary supply gets on from reset parameter menu. Same is applicable for CT primary value also.

3.2.1.3 Potential Transformer secondary Value

The value must be set to the nominal full scale secondary voltage which will be obtained from the the Transformer when the potential transformer(PT)primary is supplied with the voltage defined in 3.2.1.2 potential transformer primary voltage. The ratio of full scale primary to full scale secondary is defined as the transformer ratio.

This screen can be accessed only from system parameters list menu. Here again 0 to 9 digit input keypad is provided to set value of PT Secondary, & user can confirm this value with a simple touch on “ ENTER key”.

Valid range of PT secondary setting value is from 100 to 500.0 VL-L. If value outside the range is entered, It will display “INVALID VALUE” followed by correct range of parameter.

3.2.1.4 Current Transformer Primary Value

The nominal Full Scale Current that will be displayed as the Line currents. This screen enables the user to display the Line currents inclusive of any transformer ratios, the values displayed represent the Current in Amps.

In case presently displayed Current Transformer Primary Value together with the Potential Transformer Primary Value results in a maximum power of greater than 666.6 MVA, "INVALID VALUE" will be displayed. Example:

If primary value of PT is set as 692.8kV L-L (max value) then primary value of Current is restricted to 1157A.

The "Maximum Power" restriction of 666.6 MVA refers to 120% of nominal current and 120% of nominal voltage, i.e, 462.96 MVA nominal power per phase. Valid range of CT primary setting value is from 1 to 9999. If value outside the range is entered, It will display "INVALID VALUE" followed by correct range of parameter.

Note : Setting CT primary value will reset all TOD data & all energies.

3.2.1.5 Current Transformer Secondary Value

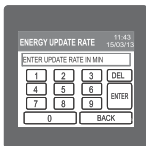


This screen is used to set the secondary value for Current Transformer. Two options: 1 AMPERE & 5 AMPERE are displayed on screen. Touching radio button in front of particular option will select that option. Touch on " " key" will confirm the setting. Touching the " " key" will keep the old selected setting and will return to previous menu.

3.2.1.6 Demand Integration Time

This screen is used to set the period over which current and power readings are to be integrated. Four options: 8, 15, 20, 30 Minutes are displayed on screen. Touching radio button in front of particular option will select that option.

3.2.1.7 Energy update rate



This screen allows user to enter energy update rate in min.

After entering particular value in min. the energy will be updated on modbus location from 30145 to 30153 of 3X register as per value that user has entered.

User can set value from 1 min to 60 min. If user enters value more than 60 min. then "INVALID VALUE" will be displayed and valid band will be shown.

Touching the " key" will keep the old selected setting and will return to previous menu.

For example user has entered 2 min as energy update rate. then after every 2 min, energy counts will be updated on modbus.

3.2.1.8 Low Current noise cutoff.

This screen allows the user to set Low noise current cutoff in mA.



Two options, 0 MILLI-AMPERE & 30 MILLI-AMPERE are displayed on screen. Touching radio button in front of particular option will select that option.

Touch on " key" will confirm the setting.

Touching the " key" will keep the old selected setting and will return to previous menu.

3.2.1.9 ENERGY RESOLUTION:

This screen enable user to set energy resolution in terms of Wh / kWh / MWh depending as per the user's requirement .This setting is applicable for all types of energy.

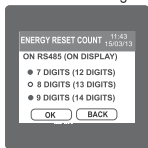


Three options: WATT HOUR, KILO-WATT HOUR & MEGA-WATT HOUR are displayed on screen. Touching radio button in front of particular option will select that option. If $(PT \text{ primary} * CT \text{ primary} * \text{Root3}) > 30000$ KW then two options: KILO-WATT HOUR & MEGA-WATT HOUR are displayed on screen.

Note : Default value is set to 'WATT HOUR' i.e. Energy resolution will be in terms of Wh / VAh / Vah respectively .

3.2.1.10 ENERGY DIGIT RESET COUNT (ROLLOVER COUNT):

This screen enables the user to for setting maximum energy count after which energy will roll over to zero. This setting is applicable for all types of energy. Counts outside brackets shows the no.



of digits after which energy in 3X register on MODBUS will roll over to zero. The roll over count for overflow count in 3X register on MODBUS is 5 digits. The values inside the brackets show rollover count for energy on display.

3.2.2 Communication Parameter Selection :

After entering in the "COMMUNICATION PARAMETERS" list of following parameters will be displayed

3.2.2.1 RS485 ADDRESS

3.2.2.2 Rs485 BAUD RATE

3.2.2.3 Rs485 PARITY

3.2.2.1 Rs485 Address Setting



This screen applies to the RS 485 output only. This screen allows the user to set RS485 address parameter for the instrument.

This screen can be accessed only from Communication Parameters List menu.

The range of allowable address is 1 to 247.

If value outside the range is entered, it will display "INVALID VALUE" followed by the correct range of parameter.

3.2.2.2 RS 485 Baud Rate

This screen allows the user to set Baud Rate of RS 485 port. Four options: 4800, 9600, 19200, 38400 Bauds are displayed on screen. Touching radio button in front of particular option will select that option.

3.2.2.3 RS 485 Parity & Stop bit Selection

This screen allows the user to set Parity & number of stop bits. Four options: ODD PARITY WITH ONE STOP BIT, NO PARITY WITH ONE STOP BIT, NO PARITY WITH TWO STOP BITS, EVEN PARITY WITH ONE STOP BIT are displayed on screen. Touching radio button in front of particular option will select that option.

3.2.3 Reset Parameter Selection

After entering in the "RESET PARAMETERS", List of following parameters will be displayed :-

- RESET ALL
- RESET DEMAND PARAMETERS
- RESET ALL ENERGIES
- RESET MAX VOLTAGE AND CURRENT
- RESET MIN VOLTAGE AND CURRENT
- RESET RUN-HOUR, ON-HOUR
- RESET AUX INTERRUPT COUNT
- RESET POWER QUALITY DATA
- RESET TIME OF DAY DATA

3.2.3.1 Resetting Parameter



These screens allow the users to reset all the parameters eg:- Energy, Min, Max, Demand, Run hour, On hour, No. of Interrupts, Power Quality Data, TOD Data. Touching "↓ down" key scrolls list in upward direction.

For resetting specific parameter user can touch on that parameter.



Touching on any parameter will display the confirmation dialog, now a touch on "YES" key" will confirm the resetting of that particular Parameter.

Touching on "NO" key" will move back to Reset parameters menu For example resetting All Energies will display a confirmation dialog as shown in the screen beside.

User can reset other parameters in similar manner. Resetting Power Quality Data will reset all events in sag, swell and overcurrent log.

While resetting any parameter if auxiliary supply gets off, reset that parameter again after auxiliary supply gets on.

3.2.4. Output Option selection menu

After entering in the "OUTPUT OPTIONS", List of following parameters will be displayed :-

3.2.4.1 RELAY-1

3.2.4.2 RELAY-2

3.2.4.1 Relay1 output Selection menu



This screen applies to the Relay1 Output option Selection .

Two options : PULSE OUTPUT & LIMIT OUTPUT displayed on screen. Touching any option will open screens of parameters related to that option.

Touch on " key" will take back to Output Options screen.

3.2.4.1.1 Pulse output

After entering in the "PULSE OUTPUT", List of following parameters will be displayed :-

3.2.4.1.1.1 ENERGY

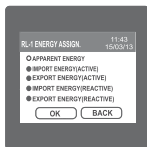
3.2.4.1.1.2 PULSE DURATION

3.2.4.1.1.3 PULSE RATE

These settings are used to assign Relay1 in Pulse output mode.

3.2.4.1.1.1 Assignment of Energy to pulse output (Relay 1) :

This screen allows the user to assign energy to pulse output (for Relay 1)



Following six options are displayed:-

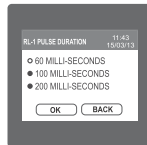
Apparent Energy Import Energy (Active)
Export Energy (Active) Import Energy (Reactive)
Export Energy (Reactive)

Touching radio button in front of any particular option will select that option. Touch on " key" will confirm the setting.

Touching the " key" will keep the old selected setting and will return to previous menu.

3.2.4.1.1.2 Pulse Duration Selection:

This screen applies only to the Pulsed output mode of both the relays.



This screen allows the user to set Relay energisation time in milliseconds. Three options: 60, 100, 200 ms are displayed on screen. Touching radio button in front of particular option will select that option.

Touch on " key" will confirm the setting.

Touching the " key" will keep the old selected setting and will return to previous menu.

3.2.4.1.1.3 Pulse Rate

This screen applies only to the Pulsed output mode of both the relays.



The screen allows user to set the energy pulse rate divisor.

Divisor values can be selected through 1,10, 100,1000. Touching radio button in front of particular value will select that value.

Touch on " key" will confirm the setting.

Touching the " key" will keep the old selected setting and will return to previous menu.

Pulse rate divisor is set to 1, when Energy Resolution is set to kWh or MWh.

3.2.4.1.2 Limit output

This screen is for Limit output mode selection. It allows the user to set Limit output corresponding measured value. After entering in Limit Output first time(was disabled previously), only "PARAMETER:" is displayed on screen. Now a simple touch on "PARAMETER:" will open list of parameters, Refer Table 3 "Parameter for Limit output" for assignment.

Now after assignment of any parameter, list of following setting parameters will be displayed:-

3.2.4.1.2.1 PARAMETER

3.2.4.1.2.2 CONFIGURATION

3.2.4.1.2.3 TRIP POINT

3.2.4.1.2.4 HYSTERESIS POINT

3.2.4.1.2.5 ENERGIZING DELAY

3.2.4.1.2.6 DE-ENERGIZING DELAY

3.2.4.1.2.1 Limit Parameter selection

This option allows the user to set Relay-1 limit to corresponding measured parameter. A simple touch on "PARAMETER" row will open screen having list of parameters. (Refer Table 3 "Parameters for limit output") . Touch on " key" will confirm the setting.

Touching the " key" will keep the old selected setting and will return to previous menu.

3.2.4.1.2.2 Limit1 Configuration select

This screen is used to set the Limit1 Configuration, four different types of configuration can be selected



HIGH ALARM & ENERGIZED RELAY
HIGH ALARM & DE-ENERGIZED RELAY
LOW ALARM & ENERGIZED RELAY
LOW ALARM & DE-ENERGIZED RELAY
(For detail refer to section 9.2)

Touching radio button in front of particular type will select that type.

Touch on " key" will confirm the setting.

Touching the " key" will keep the old selected setting and will return to previous menu.

3.2.4.1.2.3 Trip point selection

This screen applies to the Trip point selection.



This screen allows the user to set Trip point for instrument in %. This screen can be accessed only from Limit Output settings list menu. Here a 0 to 9 digit input keypad is provided to set value of Trip Point, & user can confirm this value with a simple touch on “ENTER” key.”

“BACK” key” is used to go back to Limit Output list menu.

The allowable range is from 10% to 120% for High Alarm & is from 10% to 100% for Low Alarm. For detail refer table 2.
If value outside this range is entered, it will display “INVALID VALUE” followed by correct range of parameter.

3.2.4.1.2.4 Hysteresis selection

This screen applies to the Hysteresis selection.



This screen allows the user to set Hysteresis in % for relay1. This screen can be accessed only from Limit Output settings list menu. Here a 0 to 9 digit input keypad is provided to set value of Hysteresis, & user can confirm this value with a simple touch on “ENTER” key”.

“BACK” key” is used to go back to Limit Output list menu.



The allowable range is 0.5% to 50 % of Trip point .
 If value outside this range is entered, it will display "INVALID VALUE"
 followed by correct range of parameter.

3.2.4.1.2.5 Energizing Delay time.

This screen allows the user to set Energizing Delay time for Relay 1 Limit Assigned Parameters .



This screen can be accessed only from Limit Output settings list menu.
 Here a 0 to 9 digit input keypad is provided to set value of Delay, &
 user can confirm this value with a simple touch on "ENTER" key."

"BACK" key" is used to go back to Limit Output list menu.




The allowable range is from 1 to 10 sec.
 If value outside this range is entered, it will display "INVALID VALUE"
 followed by correct range of parameter.


3.2.4.1.2.6 De-Energizing Delay time

This screen allows the user to set De-Energizing Delay time for Relay 1 Limit Assigned Parameters .



This screen can be accessed only from Limit Output settings list menu.

Here a 0 to 9 digit input keypad is provided to set value of Delay, & user can confirm this value with a simple touch on “  key.”

“  key” is used to go back to Limit Output list menu.



The allowable range is from 1 to 10 sec.

If value outside this range is entered, It will display “INVALID VALUE” followed by correct range of parameter.

3.2.4.2 Relay 2 Output Selection

Configuration of Relay 2 for Pulse or Limit Output is same as Relay 1. If you Select the Pulse output option for Relay 1 same setting will be applicable for Relay 2 except assignment of energy to Pulse output (i.e. Energy assignment of both relay can be different.)

3.2.5 Time Of Day Setup



Time Of Day Setup options allows easy configuration of TOD module Every time when this option is selected it will pop up a message to ask user to verify date & time. It will ask user if he wants to set date & time. When pressed yes user will be directed to clock setup. Pressing no will continue to Time Of Day setup.

Time Of Day :



Time-of-day metering is a rate option that is offered by many utilities. When elected by the customer, a meter that records time, and energy usage is installed in place of the existing electrical meter. The metering option benefits utility companies by decreasing the required capacity and customers by providing reduced demand and usage rates during off-peak times, which gives customers a chance to reduce their utility bill. The meter offers a flexible tariff structure. This feature provides a useful way of following different tariff structures during different times of the day for different seasons.

The Time of Use module compares the meter's internal clock with the season, day, and time of day settings in these registers, and determines the applicable rate.

Seasons , Profiles, Timezones, Type of day

Seasons :

A year can be programmed for a max. of 4 seasons. Each day of a season can be assigned different profiles. Start date of the season is to be entered. This will be active until the next season starts.

Profiles :

Daily profile contains the tariff rates for a particular time zone. A max. of 4 tariffs can be programmed.

Time Zones:

A day can be divided into max 6 time zones as per tariff rate . The number and timings of these TOD time Zones are programmable.

Type of Day: It defines the day types used in the module.

Types are weekdays, weekends, holidays, alternate days.

Weekdays:

This register defines the days of the week for all seasons. The rates in the Season (1, 2, 3, 4) Weekday time zone setup registers are used on these days.

Weekends:

This register defines the weekend days for all seasons. The rates in the Season (1,2, 3, 4) Weekend time zone setup registers are used on these days.

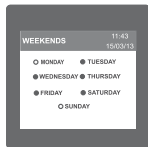
Holidays :

Holidays have higher priority than other day types . A max. of 30 holidays can be selected. The rates defined in the Season (1, 2, 3, 4) Holiday Time zone setup registers are used on these days.

Alternate days :

These days generally have different rates from weekdays, weekends, holidays. Alternate days can be assigned a separate profile. A max. of 30 alternate days can be selected.

3.2.5.1 Weekends selection



WEEKENDS 11:43
15/03/13

MONDAY TUESDAY
 WEDNESDAY THURSDAY
 FRIDAY SATURDAY
 SUNDAY

Select weekend by selecting the radio button(dark circle) in front of the day. These days will be considered as weekends for all seasons

3.2.5.2 Holidays selection

	DATE	MONTH
<input type="radio"/> H1	15	8
<input type="radio"/> H2	26	1
<input type="radio"/> H3		
<input type="radio"/> H4		

BACK

Any day can be assigned as a holiday. Holidays can have separate profile structure than other type of days. Maximum 30 holidays can be selected. To select holiday first activate holiday by touching radio button. Then touch on box to enter date and month.

3.5.2.3 Alternate days selection

Any day can be assigned as a Alternate day. Alternate days can have separate profile structure than other type of days. Maximum 30 Alternate days can be selected.

3.2.5.4 Profiles

PROFILE	RATE
PROFILE1	99.85
PROFILE2	102.50
PROFILE3	63.00
PROFILE4	84.23

BACK

Profile contain a tariff rate that can be assign to particular timezone. Max 4 profile rate can be assign. User can assign profile rate for P1, P2, P3 & P4 between 0.001 to 299.0.

3.2.5.5 Seasons

	DATE	MONTH
<input type="radio"/> S1	15	8
<input type="radio"/> S2	26	1
<input type="radio"/> S3		
<input type="radio"/> S4		

BACK

In seasons, user can define maximum 4 season for 12 months. By selecting radio button and entering valid date and month, seasons can be define. All the seasons must be in sequential order. Start date of the season is to be entered. This is will be active until the next season starts. At least 1 season must be selected for proper functioning of TOD module.

3.2.5.6 Timezones

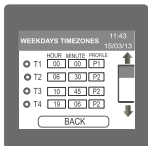


Time zone window shows the seasons which are selected. In time zone user can assign a time zone period at which different tariff profile are applicable.

3.2.5.6.1 Weekdays / Weekends / Holidays / Alternate days Timezones



User can assign different timezone, tariff profile rate for different day types in each season. User can enter time zones for 4 types of day
Weekdays
Weekends
Holidays
Alternate days



User should ensure that time zones and profile rate are assigned to all selected seasons and day types. The timezones for the day must be in sequential order and must not overlap. Minimum 1 and maximum 6 time zones can be configured. For timezone1 the default time is assigned as 00:00. User has to select a profile rate for it.

Note: When using TOD module it is recommended to set energy resolution in KWh.

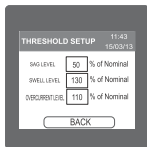
3.2.6 Power Quality Setup

3.2.6.1 Threshold Setup

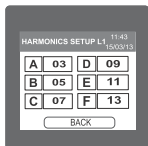


In power quality setup, user can set threshold levels for sag, swell and overcurrent detection. Also user can enter the harmonic no which user want to observe.

For threshold setup click on threshold setup menu. For sag level, touch the sag level menu and enter the value. The valid threshold level for sag is from 10 % to 90 % of nominal. If user enters wrong value then it will display "INVALID VALUE" and will display the valid range. Similarly threshold value for swell and overcurrent can be configured. The valid range for swell and overcurrent is 110 % to 150 % of nominal value. PT Secondary is considered as nominal value.



3.2.6.2 Harmonics Setup



In harmonic setup, user can define the order of harmonics that user want to observe for each phase. Maximum 6 different harmonics number can be configured at a time. For setting of harmonic, touch on the rectangle and enter the number. Valid range for harmonic no is from 2 to 56. Entering wrong value will display "INVALID VALUE" and will show the valid range.

3.2.7 Clock Setup



User can set the date and time through this window. By touching the on date, month, year, hour and minute, keypad will pop up and user can enter the date and time through it. Changing hour, date, month, year TOD data will get reset for that period.

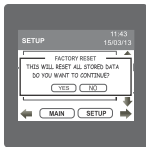
3.2.8 Brightness & Contrast



The brightness & contrast of the TFT LCD screen can be varied by the user by sliding the sliders. Touching the " key" will confirm the current brightness contrast setting.

Touching the DEFAULT key will set brightness and contrast as per factory settings. Touching the BACK key will move back to the setup menu without making any changes.

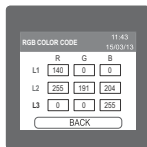
3.2.9 Factory Reset




Factory reset option resets all the stored data to its default value. After factory reset meter will restart automatically with default setup values.

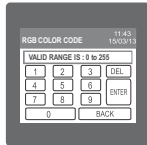
Note: Do not interrupt auxiliary supply while factory reset is in process. If auxiliary supply gets interrupted when factory reset is in process, do the factory reset again when auxiliary supply gets ON.


3.2.10 RGB Color Code



This screen allows user to set the values of Red, Green and Blue components of colors used to display the parameters of all three phases. Different colors can be assigned to each phase using combination of Red, Green and Blue component values. L1,L2,L3 will be set to the assigned color.

To set these values, touch the corresponding rectangular section, 0 to 9 digit input keypad will appear. After entering the value using this keypad, user can confirm this value with a simple touch on “ key”.



“ key” is used to go back to previous screen.

The allowable range for these values is 0 to 255. If a value outside this range is entered, it will display “VALID RANGE IS : 0 to 255”.

Note : Colors similar to background color are not recommended.

TABLE 2 : Standard color combinations

COLOR	R	G	B
Black	0	0	0
Blue	0	0	255
Brass	181	166	66
Bronze	204	128	51
Brown	166	41	41
Copper	184	115	51
Dark Blue	0	0	140
Dark Brown	102	66	33
Dark Green	0	51	33

COLOR	R	G	B
Dark Pink	232	84	128
Dark Purple	48	26	51
Dark Red	140	0	0
Dark Violet	148	0	212
Dark Yellow	156	135	13
Gold	212	176	56
Gray	128	128	128
Green	0	255	0
Indigo	74	0	130

COLOR	R	G	B
Light Blue	173	217	230
Maroon	176	48	97
Pink	255	191	204
Purple	161	33	240
Red	255	0	0
Silver	191	191	191
Violet	143	0	255
White	255	255	255
Yellow	255	255	0

4 Touch screen calibration

This instrument is able to perform calibration to ensure the proper operation of the units touch screen functionalities. The calibration procedure will correct the problem of out of tolerance touch screen malfunction. Note that errors corrected by this calibration procedure are specific only to touch screen operation.



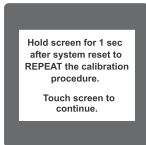
For starting touch screen calibration, touch the screen any where for 1 sec at system reset. After that touch screen calibration will start & the message shown besides will be displayed. Touch the screen to continue.



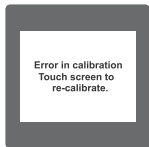
Follow the instructions displayed. Press & hold the center of the filled red circle for at least 2 seconds. Release when message for release is being displayed. For accurate results try to touch the center of the filled circle.



Repeat the same procedure for the remaining 3 corner circles.



After successful calibration, the message shown besides would be displayed. Touch the screen to continue.



If the touch screen was not calibrated properly, "Error in calibration" message would be shown & the user will be asked to recalibrate the touch screen. In such case the meter will retain the previously stored touch - screen calibration values unless a successful calibration is being performed.

5. Phase Rotation Error screen



Meter shows phase rotation error if the phase sequence R-Y-B (L1-L2-L3) is not maintained. This screen indicates that Phase sequence is incorrect. User must check this screen in order to get correct readings. When meter is connected.



Correct Phase sequence

This screen indicates the phase sequence connected to meter is correct. If phase sequence is wrong this screen is useful to get correct phase sequence by interchanging connection & verifying it with screen.



This Screen indicates that either of the phases or all three phases (Voltages) are absent.

6. Run Hour



This Screen shows the total no. of hours the load is connected Even if the Auxiliary supply is interrupted count of Run hour will be maintained in internal memory & displayed in the format "hours. min". For example if Displayed count is 000001.19 hrs it indicates 1 hours & 19 minutes.

After 999999.59 run hours display will restart from zero.
To reset run hour manually see section Resetting Parameter 3.2.3.1

7. On Hour



This Screen shows the total no. of hours the Axillary Supply is ON. Even if the Auxiliary supply is interrupted count of On hour will be maintained in internal memory & displayed in the format "hours. min". For example if Displayed count is 000005.18 hrs it indicates 5 hours & 18 minutes.

After 999999.59 On hours display will restart from zero.
To reset On hour manually see section Resetting Parameter 3.2.3.1

8. Number of Interruption



This Screen Displays the total no. of times the Axillary Supply was Interrupted. Even if the Auxiliary supply is interrupted count will be maintained in internal memory

To reset No of Interruption manually see section Resetting Parameter 3.2.3.1

TABLE 3 : Parameters for Limit output

Parameter No.	Parameter	3P 4W	3P 3W	Range
				Limit Output
0	None	✓	✓	–
1	INPUT VOLTAGE L1	✓	✓	10 - 120 %
2	INPUT VOLTAGE L2	✓	✓	10 - 120 %
3	INPUT VOLTAGE L3	✓	✓	10 - 120 %
4	INPUT CURRENT IL1	✓	✓	10 - 120 %
5	INPUT CURRENT IL2	✓	✓	10 - 120 %
6	INPUT CURRENT IL3	✓	✓	10 - 120 %
7	ACTIVE POWER L1	✓	✗	10 - 120 %
8	ACTIVE POWER L2	✓	✗	10 - 120 %
9	ACTIVE POWER L3	✓	✗	10 - 120 %
10	APPARENT POWER L1	✓	✗	10 - 120 %
11	APPARENT POWER L2	✓	✗	10 - 120 %
12	APPARENT POWER L3	✓	✗	10 - 120 %
13	REACTIVE POWER L1	✓	✗	10 - 120 %
14	REACTIVE POWER L2	✓	✗	10 - 120 %

Parameter No.	Parameter	3P 4W	3P 3W	Range
				Limit Output
15	REACTIVE POWER L3	✓	✗	10 - 120 %
16	POWER FACTOR L1	✓	✗	10 - 90 % ⁽³⁾
17	POWER FACTOR L2	✓	✗	10 - 90 % ⁽³⁾
18	POWER FACTOR L3	✓	✗	10 - 90 % ⁽³⁾
19	PHASE ANGLE L1	✓	✗	10 - 90 % ⁽²⁾
20	PHASE ANGLE L2	✓	✗	10 - 90 % ⁽²⁾
21	PHASE ANGLE L3	✓	✗	10 - 90 % ⁽²⁾
22	VOLTAGE AVG	✓	✓	10 - 120 %
24	CURRENT AVG	✓	✓	10 - 120 %
27	ACTIVE POWER SUM	✓	✓	10 - 120 %
29	APPARENT POWER SUM	✓	✓	10 - 120 %
31	REACTIVE POWER SUM	✓	✓	10 - 120 %
32	POWER FACTOR AVG	✓	✓	10 - 90 % ⁽³⁾
34	PHASE ANGLE AVG	✓	✓	10 - 90 % ⁽²⁾
36	FREQUENCY	✓	✓	10 - 90% ⁽¹⁾
43	WATT DEMAND IMPORT	✓	✓	10 - 120 %
44	WATT MAX DEMAND IMP.	✓	✓	10 - 120 %
45	WATT DEMAND EXPORT	✓	✓	10 - 120 %
46	WATT MAX DEMAND EXP.	✓	✓	10 - 120 %
51	VA DEMAND	✓	✓	10 - 120 %
52	VA MAX DEMAND	✓	✓	10 - 120 %
53	CURRENT DEMAND	✓	✓	10 - 120 %
54	CURRENT MAX DEMAND	✓	✓	10 - 120 %
55	Relay Manual OFF Operation	✓	✓	NA
56	Relay Manual ON Operation	✓	✓	NA

Parameter No.	Parameter	3P 4W	3P 3W	Range
				Limit Output
101	INPUT VOLTAGE L12	✓	✘	10 - 120 %
102	INPUT VOLTAGE L23	✓	✘	10 - 120 %
103	INPUT VOLTAGE L31	✓	✘	10 - 120 %
104	V1 THD (%)	✓	✓	5 - 100 %
105	V2 THD (%)	✓	✓	5 - 100 %
106	V3 THD (%)	✓	✓	5 - 100 %
107	I1 THD (%)	✓	✓	5 - 100 %
108	I2 THD (%)	✓	✘	5 - 100 %
109	I3 THD (%)	✓	✓	5 - 100 %
110	System Voltage THD (%)	✓	✓	5 - 100 %
111	System Current THD (%)	✓	✓	5 - 100 %
113	NEUTRAL CURRENT	✓	✘	5 - 100 %
123	VTHD L1 (%)	✓	✓	5 - 100 %
124	ITHD L1 (%)	✓	✓	5 - 100 %
131	Voltage HD Harmonic A L1	✓	✓	5 - 100 %
132	Current HD Harmonic A L1	✓	✓	5 - 100 %
139	Voltage HD Harmonic B L1	✓	✓	5 - 100 %
140	Current HD Harmonic B L1	✓	✓	5 - 100 %
147	Voltage HD Harmonic C L1	✓	✓	5 - 100 %
148	Current HD Harmonic C L1	✓	✓	5 - 100 %
155	Voltage HD Harmonic D L1	✓	✓	5 - 100 %
156	Current HD Harmonic D L1	✓	✓	5 - 100 %
163	Voltage HD Harmonic E L1	✓	✓	5 - 100 %
164	Current HD Harmonic E L1	✓	✓	5 - 100 %
171	Voltage HD Harmonic F L1	✓	✓	5 - 100 %

Parameter No.	Parameter	3P 4W	3P 3W	Range
				Limit Output
172	Current HD Harmonic F L1	✓	✓	5 - 100 %
179	VTHD L2 (%)	✓	✓	5 - 100 %
180	ITHD L2 (%)	✓	✗	5 - 100 %
187	Voltage HD Harmonic A L2	✓	✓	5 - 100 %
188	Current HD Harmonic A L2	✓	✗	5 - 100 %
195	Voltage HD Harmonic B L2	✓	✓	5 - 100 %
196	Current HD Harmonic B L2	✓	✗	5 - 100 %
203	Voltage HD Harmonic C L2	✓	✓	5 - 100 %
204	Current HD Harmonic C L2	✓	✗	5 - 100 %
211	Voltage HD Harmonic D L2	✓	✓	5 - 100 %
212	Current HD Harmonic D L2	✓	✗	5 - 100 %
219	Voltage HD Harmonic E L2	✓	✓	5 - 100 %
220	Current HD Harmonic E L2	✓	✗	5 - 100 %
227	Voltage HD Harmonic F L2	✓	✓	5 - 100 %
228	Current HD Harmonic F L2	✓	✗	5 - 100 %
235	VTHD L3 (%)	✓	✓	5 - 100 %
236	ITHD L3 (%)	✓	✓	5 - 100 %
243	Voltage HD Harmonic A L3	✓	✓	5 - 100 %
244	Current HD Harmonic A L3	✓	✓	5 - 100 %
251	Voltage HD Harmonic B L3	✓	✓	5 - 100 %
252	Current HD Harmonic B L3	✓	✓	5 - 100 %
259	Voltage HD Harmonic C L3	✓	✓	5 - 100 %
260	Current HD Harmonic C L3	✓	✓	5 - 100 %
267	Voltage HD Harmonic D L3	✓	✓	5 - 100 %
268	Current HD Harmonic D L3	✓	✓	5 - 100 %

Parameter No.	Parameter	3P 4W	3P 3W	Range
				Limit Output
275	Voltage HD Harmonic E L3	✓	✓	5 - 100 %
276	Current HD Harmonic E L3	✓	✓	5 - 100 %
283	Voltage HD Harmonic F L3	✓	✓	5 - 100 %
284	Current HD Harmonic F L3	✓	✓	5 - 100 %

Note : Parameters 1,2,3 are L-N Voltage for 3P 4W & L-L Voltage for 3P 3W .

(1) For Frequency 0% corresponds to 45 Hz & 100% corresponds to 66 Hz.

(2) For Phase Angle 0% corresponds to 0° & 100% corresponds to 360°

(3) For Power Factor 0% corresponds to -1 & 100% corresponds to +1.

NA : Not Applicable

9. Relay output (Optional) :

This instrument is provided with either 1 or 2 relay for pulse output as well as for limit switch

9.1 Pulse Output :

Pulse output is the potential free, very fast acting relay contact which can be used to drive an external mechanical counter for energy measurement.

This instrument's pulse output can be configured to any of the following parameter through setup parameter screen

- 1) Active Energy (Import)
- 2) Active Energy (Export)
- 3) Reactive Energy (Import)
- 4) Reactive Energy (Export)
- 5) Apparent Energy

TABLE 4 : Energy Pulse Rate Divisor

1.For Energy Output in Wh

Divisor	Pulse rate	
	Pulse	System Power*
1	1per Wh	Up to 3600W
	1per kWh	Up to 3600kW
	1per MWh	Above 3600kW
10	1per 10Wh	Up to 3600W
	1per 10kWh	Up to 3600kW
	1per 10MWh	Above 3600kW
100	1per 100Wh	Up to 3600W
	1per 100kWh	Up to 3600kW
	1per 100MWh	Above 3600kW
1000	1 per 1000Wh	Up to 3600W
	1 per 1000kWh	Up to 3600kW
	1per 1000MWh	Above 3600kW
Pulse Duration 60 ms, 100 ms or 200 ms		

2. For Energy Output in KWh

Divisor	Pulse rate	
	Pulse	System Power*
1	1 per kWh	Up to 3600kW
	1per MWh	Above 3600kW

3. For Energy Output in MWh

Pulse rate	
Divisor	Pulse
1	1 per MWh

Above options are also applicable for Apparent and Reactive Energy.

* System power = $3 \times CT(\text{Primary}) \times PT(\text{Primary})_{L-N}$ for 3 Phase 4 Wire

System power = $\text{Root}3 \times CT(\text{Primary}) \times PT(\text{Primary})_{L-L}$ for 3 Phase 3 Wire

9.2 Limit Switch :

Limit switch can be used to monitor the measured parameter (Ref.Table:3)in relation with to a set limit.

The limit switch can be configured in one of the four mode given below:-

- 1) Hi alarm & Relay Energized Relay..
- 2) Hi alarm & De-Energized Relay.
- 3) Lo alarm & Energized Relay.
- 4) Lo alarm & De-Energized Relay.

Limit switch has user selectable Trip point, Hysteresis, Energizing Delay & De-Energizing delay.

Hi Alarm:

If Hi-Alarm Energized or Hi Alarm De-Energized option is selected then relay will get energized or De-energized,if selected parameter is greater than or equal to trip point.

Lo Alarm:

If Lo-Alarm Energized or Lo Alarm De-Energized option is selected then relay will get energized or De-energized,if selected parameter is less than or equal to trip point.

Trip point:

Trip point can be set in the range of 10% to 120 % of nominal value for Hi-Alarm & 10% to 100 % of nominal value for Lo-Alarm.

Hysteresis:

Hysteresis can be set in the range of 0.5% to 50 % of set trip point .

If Hi-alarm Energized or Hi-alarm De-energized is selected then relay will get De-energized or Energized respectively, if set parameter value is less than Hysteresis Similarly if Lo-alarm Energized or Lo-alarm De-Energized.

Energizing Delay:

The energizing delay can be set in the range from 1 to 10 sec.

De-Energizing Delay:

The De-energizing delay can be set in the range from 1 to 10 sec.

Note : In case of Lo alarm if trip point is set at 100% then maximum 20% Hysteresis can be set..

Example of different configuration.

Parameter No: 4 (Current 1)

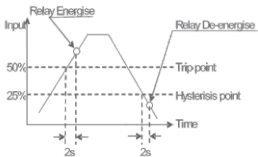
Trip Point = 50%

Hysteresis = 50% of trip point

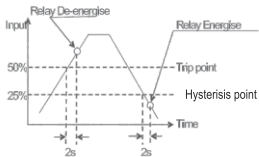
Energising Delay: 2s

De-energising Delay: 2s

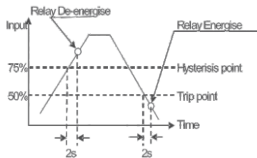
1) Hi alarm & Energised relay



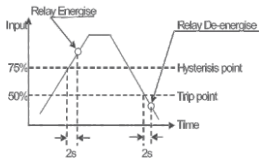
2) Hi alarm & De-energised relay



3) Lo alarm & Energised relay



4) Lo alarm & De-energised relay



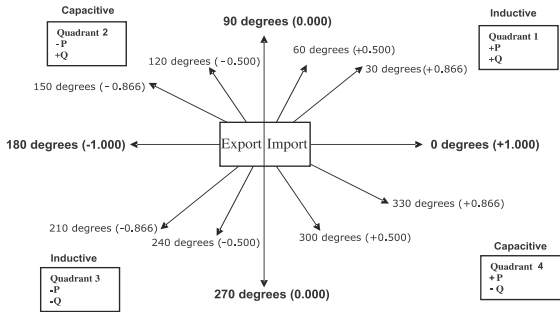
10. Phasor Diagram :

Quadrant 1: 0° to 90°

Quadrant 2: 90° to 180°

Quadrant 3: 180° to 270°

Quadrant 4: 270° to 360°



Connections	Quadrant	Sign of Active Power (P)	Sign of Reactive Power (Q)	Sign of Power Factor (PF)	Inductive / Capacitive
Import	1	+ P	+ Q	+	L
Import	4	+ P	- Q	+	C
Export	2	- P	+ Q	-	C
Export	3	- P	- Q	-	L

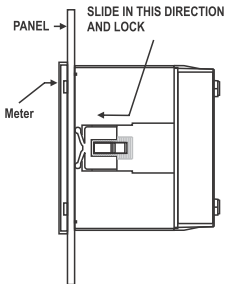
Inductive means Current lags Voltage
Capacitive means Current leads Voltage

When the instrument displays Active power (P) with “ + ” (positive sign) , the connection is “ **Import** ” .

When the instrument displays Active power (P) with “ - ” (negative sign) , the connection is “ **Export** ” .

11. Installation

Mounting is by four side clamps, slide the side clamps through side slot till side clamp gets firmly locked in a groove (Refer fig.) Consideration should be given to the space required behind the instrument to allow for bends in the connection cables.



As the front of the enclosure conforms to IP54 it is protected from water spray from all directions, additional protection to the panel may be obtained by the use of an optional panel gasket. The terminals at the rear of the product should be protected from liquids.

The instrument should be mounted in a reasonably stable ambient temperature and where the operating temperature is within the range -10 to 55 °C . Vibration should be kept to a minimum and the product should not be mounted where it will be subjected to excessive direct sunlight.

Caution

- 1. In the interest of safety and functionality this product must be installed by a qualified engineer, abiding by any local regulations.**
- 2. Voltages dangerous to human life are present at some of the terminal connections of this unit. Ensure that all supplies are de-energised before attempting any connection or disconnection.**
- 3. These products do not have internal fuses therefore external fuses must be used to ensure safety under fault conditions.**

11.1 EMC Installation Requirements

This product has been designed to meet the certification of the EU directives when installed to a good code of practice for EMC in industrial environments, e.g.

1. Screened output and low signal input leads or have provision for fitting RF suppression components, such as ferrite absorbers, line filters etc., in the event that RF fields cause problems.

Note: It is good practice to install sensitive electronic instruments that are performing critical functions, in EMC enclosures that protect against electrical interference which could cause a disturbance in function.

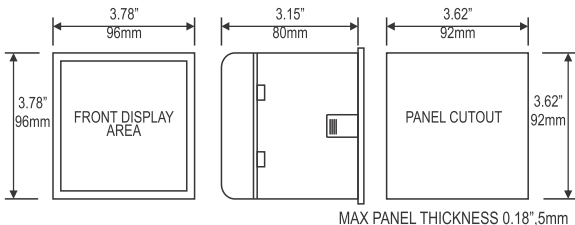
2. Avoid routing leads alongside cables and products that are, or could be, a source of interference.

- To protect the product against permanent damage, surge transients must be limited to 2kV pk. It is good EMC practice to suppress differential surges to 2kV at the source. The unit has been designed to automatically recover in the event of a high level of transients. In extreme circumstances it may be necessary to temporarily disconnect the auxiliary supply for a period of greater than 5 seconds to restore correct operation.

The Current inputs of these products are designed for connection in to systems via Current Transformers only, where one side is grounded.

- ESD precautions must be taken at all times when handling this product.

11.2 Case Dimension and Panel Cut Out



11.3 Wiring

Input connections are made directly to screw-type terminals with indirect wire pressure. Numbering is clearly marked in the plastic moulding. Choice of cable should meet local regulations. Terminal for both Current and Voltage inputs will accept upto $3\text{mm}^2 \times 2$ diameter cables.

Note : It is recommended to use wire with lug for connection with meter.

11.4 Auxiliary Supply

The instrument should ideally be powered from a dedicated supply, however it may be powered from the signal source, provided the source remains within the limits of the chosen auxiliary voltage.

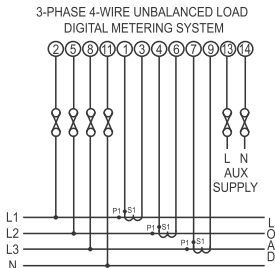
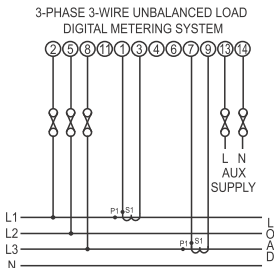
11.5 Fusing

It is recommended that all voltage lines are fitted with 1 amp HRC fuses.

11.6 Earth/Ground Connections

For safety reasons, CT secondary connections should be grounded in accordance with local regulations.

12. Connection Diagrams



13. Specification :

System

3 Phase 3 Wire / 4 Wire programmable at site

Inputs

Nominal input voltage (AC RMS) (Three wire and Four wire)	Line-Neutral 57.73...288.675 V_{L-N} Line-Line 100... 500 V_{L-L}
Max continuous input voltage	347 V_{L-N} , (600 V_{L-L})
Max short duration input voltage	2 x Nominal Value (1s application repeated 10 times at 10s intervals)
Nominal input voltage burden	0.2VA approx. per phase
Nominal input current	1A / 5A AC rms
Max continuous input current	120% of Nominal Value
Nominal input current burden	0.2VA approx. per phase
Max short duration current input	20 x Nominal Value (1s application repeated 5 times at 5 min. intervals)
System CT primary values	Std. Values from 1 to 9999A (1 or 5 Amp secondary)

Auxiliary

Standard nominal Auxillary supply voltages & Frequency	60 - 300V AC- DC (45-66Hz),
a.c. supply voltage tolerance	+5 % / -5 % of Rated Value
a.c. supply frequency range	45 to 66 Hz
a.c. supply burden	<6.5VA

Operating Measuring Ranges

Voltage	5 V_{L-N} ... 347 V_{L-N} , 9 V_{L-L} ... 600 V_{L-L} .
Current	5 .. 120 % of Nominal Value
Frequency	45 .. 66 Hz

Accuracy

Voltage	± 0.2 % of Nominal value
Current	± 0.2 % of Nominal value
Frequency	0.1% of mid frequency
Active Power	± 0.2 % of Nominal value
Re- Active Power	± 0.2 % of Nominal value
Apparent Power	± 0.2 % of Nominal value
Active Energy	Class 0.5S as per IEC 62053 - 22
Apparant Energy	Class 0.5S as per IEC 62053 - 22
Re - Active Energy	Class 2 as per IEC 62053 - 23
Power Factor / Phase angle	± 2 degree
Harmonics	± 1 %
Total Harmonic Distortion	± 1 %

Reference conditions (As per IEC / EN 60688) :

	Ambient 23 °C ± 1 °C
	Sinusoidal (distortion factor 0.005), 50 / 60 Hz
Current Range	5... 100% of Nominal Value.
Starting Current for energy as per IEC 62053 - 22 0.5S	1 mA for 1A range 5 mA for 5A range

Display

TFT LCD	3.5" Graphical LCD, resolution 320x240 pixels
Update	Approx. 1 seconds

Controls

User Interface	Resistive Touch screen
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Real Time Clock (RTC) :

Uncertainty	+/- 2 minutes / months (23 °C ± 1 °C) (trimmable through display or MODBUS)
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Standards

EMC Immunity

IEC 61326

10V/m min-Level 3 industrial low level
electromagnetic radiation environment

IEC 61000-4-3.

IEC 61010-1 , Year 2001

IEC 60529

Safety

IP for water & dust

Isolation

Dielectric voltage withstand
test between circuits and
accessible surfaces

5.23 kV DC for 1 minute
between all electrical circuits

Environmental

Operating temperature

-10 to 55 °C

Storage temperature

-20 to +65 °C

Relative humidity

0 .. 90 % RH

Warm up time

3 minute (minimum)

Shock

15g in 3 planes

Vibration

10 .. 150 .. 10 Hz, 0.75mm amplitude

Enclosure (front only)

IP 54 as per IEC 60529

Temperature Coefficient

0.05%/°C

Enclosure

Style

96mm x 96mm DIN Quadratic

Material

Polycarbonate Housing ,

Terminals

Self extinguish & non dripping as per UL 94 V-0
Screw-type terminals

Depth

< 80 mm

Weight

0.600 kg Approx.

Pulse output Option (1 or 2 Relay) :

Relay	1NO + 1NC
Switching Voltage & Current	240V AC , 5Amp.
Default Pulse rate Divisor	1 per Wh (up to 3600W), 1 per kWh (up to 3600kW), 1 per MWh (above 3600 kW)
Pulse rate Divisors	Programmable on site
10	1 per 10Wh (up to 3600W), 1 per 10kWh (up to 3600kW), 1 per 10MWh (above 3600 kW)
100	1 per 100Wh (up to 3600W), 1 per 100kWh (up to 3600kW), 1 per 100MWh (above 3600 kW)
1000	1 per 1000Wh (up to 3600W), 1 per 1000kWh (up to 3600kW), 1 per 1000MWh (above 3600 kW)
Pulse Duration	60ms , 100ms or 200ms

Note : Above conditions are also applicable for Reactive & Apparent Energy .

Note : Pulse rate divisor is set to 1, when Energy Resolution is set to kWh or MWh.

ModBus (RS 485) Option :

Protocol	ModBus (RS 485)
Baud Rate	38400, 19200 , 9600 , 4800 (Programmable)
Parity	Odd or Even, with 1 stop bit, Or None with 1 or 2 stop bits

Impulse Output :

Impulse Constant	4000 impulses / KWh
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NOTE

The Information contained in these installation instructions is for use only by installers trained to make electrical power installations and is intended to describe the correct method of installation for this product.

It is the user's responsibility to determine the suitability of the installation method in the user's field conditions.

